

Correction and stabilisation in ankylosing spondylitis of the cervicothoracic spine

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Introduction

The ankylosing spondylitis is an inflammatory disease affecting more or less the whole spine with quite significant secondary problems like severe kyphosis and inability to correct spontaneously this kyphosis due to the ankylosis. If the kyphosis is mostly in the cervicothoracic spine, patients tend to look towards the floor and are unable to have a horizontal view. Depending on where the major deformity lies, different osteotomies of the spine are possible, mostly in the area of the upper lumbar spine or, as in this specific case presented in this series, an osteotomy at the lower cervical spine (C6/7). This osteotomy has been demonstrated many years ago, first by Ed Simmons in Toronto, where he did osteotomies in local anaesthesia and in sitting position, in order to control the neurological function during the osteotomy procedure. Since then, with modern instrumentation technology, it has become possible to do this osteotomy in prone position and to fix the corrected spine with a powerful pedicular system instead of treating the patient over weeks and months in a Halo jacket. These patients are operated without a wake-up test and in general anaesthesia, under continuous neuromonitoring in order to control the neurological function whilst the extension osteotomy in the lower cervical spine is conducted.

Case description

The patient is a 60-year-old male who suffers from an ankylosing spondylitis. His forward vision is quite disturbed by the deformity and he is unable to look straight forward. The X-rays show a classical bamboo spine and a significant kyphosis at the cervicothoracic junction which explains the patient's clinical appearance.

Surgical procedure

The patient is put on the operating table in prone position and slightly in anti-Trendelenburg position to make sure that there is no congested head during the surgery. The head is positioned in a Mayfield clamp. The drape is transparent, so that the head can be observed during the surgical manoeuvre and in particular during the extension correction. The neuromonitoring system is installed. Image intensifier of the lateral view is necessary. At the end of the correction, the front of the head has to be parallel with the ground floor. The skin is folded in horizontal lines, in order to correctly adapt the skin at the end of the surgery. A midline incision is performed for the lower and middle cervical spine as well as the upper thoracic spine. Usually three to four cervical vertebrae, i.e., from C4, C5, C6, sometimes C3, to T5, T6, are exposed. This can be done in two steps to limit bleeding, i.e., first the cervical spine can be exposed and prepared and all the massa lateralis screws positioned. If the anatomical landmarks are no longer visible, the positioning of the screws needs to be done in a lateral and ap-view of the image intensifier. At least the massa lateralis of C6 and C7 must be seen from inside through the laminectomy, which needs to be performed. Then the upper thoracic spine is exposed and pedicle screws, usually of 5 mm diameter, are positioned. A regular 5 mm small stature rod is used in the thoracic spine, which goes continuously over into a 3 mm rod. When all

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the screws are positioned, a laminectomy of C7 is performed. The lamina of C6 is undercut as well as the lamina of T1 to allow the cord during the extension manoeuvre to expand in this space as it comes to a folding of the dural sac. Above and below the pedicle stump of C7 an osteotomy is made from the inside of the spinal canal. From the vertebral body C7 a wedge osteotomy is consequently taken out, whereas the pedicle stumps constitute the base of the wedge triangle.

To make the column break, the extension manoeuvre has to be done very carefully. Either the anterior cortex breaks or it is prepared by the osteotomy before in such a way that we have a prepared break line or it breaks through the disc or through the plasticity of the tissue. The osteotomy is slowly closed by a surgeon who manipulates the head within the clamp and positions the head in the right position. To secure the stability, the rod can be fixed in the cervical screws even before performing the extension manoeuvre and the angulation of the rod can be prebent according to the amount of correction which is aimed for, i.e., as soon as the rod reaches the screws in the thoracic spine, a temporary fixation can be made in order to avoid any translation of the cervical spine in the osteotomy area. Finally, the rods are fixed in all the screws and a strong fusion with the bone, which has been removed by the laminectomies and osteotomies, is performed.

Discussion and conclusion

The osteotomy of the ankylosing spondylitis in the lower cervical spine through a wedge osteotomy is a demanding and complex procedure which needs a careful preparation and a proper perioperative management and monitoring of the patient. Modern instrumentation and anaesthesiological technology today facilitates surgery in general anaesthesia under neuromonitoring and with precise cervical posterior instrumentation in order to avoid a Halo treatment of the patient. Usually, the postoperative immobilization is by a soft collar to remind the patient of the surgery. It is crucial that the wedge osteotomy is made in a way and measured, that the cranial and the caudal end of the osteotomy will

close together and come into contact. It is equally important to prepare the space in which the dural sac with the spinal cord can fold in, meaning that the arches of C6 as well as T1 need to be undercut sufficiently. The easiest way to do this surgery in a controlled manner is to do the laminectomy of C7, to expose the dural sac, to expose the root C7 between the pedicles C6 and C7 as well as the root C8 between the pedicles C7 and T1. These roots need to be seen and identified in order to do a proper reduction osteotomy of the pedicles of C7 in a safe way. Also from these pedicles, it is easy to osteomise towards the midline in front of the spinal cord under vision. The osteotomy of the vertebral body, respectively, the calcified disc, is vital to facilitate the breakage of the anterior column when doing the extension manoeuvre.

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